REMARKS

Claim Amendments

Applicants request entry of amendments to claims 31 and 41. No new matter has been introduced into this application by reason of the amendments presented herewith. No new matter has been introduced into this application by reason of the amended claims presented herewith. The claim amendments are supported by the following references to the Specification.

Claims 31 and 41 are amended to state that the memory elements and transmitter are powered only when the photovoltaic cell is illuminated by laser light. This amendment is supported by the Specification, page 12, lines 16 – 18. In addition, dependant claim 32 has been incorporated into claim 31 as step (f). This amendment is supported by the original claim 2.

Obvious-type Double Patenting Rejections

Claims 31 - 46 stand rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-19 of U.S. Patent Number 6,051,377 in view of either Zavracky *et al.* (U.S. Patent Number 4,989,934) or Nova *et al.* (U.S. Patent Number 5,751,629) ("Nova '629") and further in view of Tuttle (U.S. Patent Number 5,300,875).

Claims 31 - 46 stand rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-12 of U.S. Patent Number 6,001,571 in view of either Zavracky *et al.* (U.S. Patent

Number 4,989,934) or Nova *et al.* (U.S. Patent Number 5,751,629) ("Nova '629") and further in view of Tuttle (U.S. Patent Number 5,300,875).

Claims 31 - 46 stand rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-12 of U.S. Patent Number 5,736,332 in view of either Zavracky *et al.* (U.S. Patent Number 4,989,934) or Nova *et al.* (U.S. Patent Number 5,751,629) ("Nova '629") and further in view of Tuttle (U.S. Patent Number 5,300,875).

Applicant requests that the above obviousness-type double patenting rejections be held in abeyance until the allowance of claims.

Rejection under 35 U.S.C. §103(a).

Claims 31 – 33, 35, and 37 – 46 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Nagai *et al.* (JP 04148700 A2) in view of Nova '629 and further in view of Tuttle (U.S. Patent Number 5,300,875).

According to the Examiner, Nagai teaches a method of detecting a target nucleic acid comprising the steps of: providing a solid phase particle, contacting the solid phase particle with a sample; denaturing the nucleic acids; hybridizing the target nucleic with a oligonucleotide bound to the solid phase particle; and detecting the hybridized complex. Nagai also allegedly teaches the use of fluorescent labels covalently linked to the nucleic acids and a flow cytometer.

Nova allegedly teaches multiplex detection of biopolymer interactions using solid phase particles which are monolithic integrated transponder devices. The Examiner also states that Nova teaches detection of nucleic acids by

immobilization onto solid particles, a scanner device, flow system for solid phase particles, a laser, hardware to decode the signal, and the use of a photocell in the integrated device.

Tuttle is cited as teaching the integration of a photovoltaic cell as a power source for the transponder tag and a photovoltaic recharging method used to passively recharge the battery of a transponder without requiring handling.

Applicant submits that the amendment to claims 31 and 41 distinguishes the Applicant's invention from the combination of references cited. To the extent that the Examiner chooses to apply the rejection to the amended claims, it is respectfully traversed.

The Applicant's invention is directed to a method of determining the sequence of a target nucleic acid in a sample using solid phase particles having transponders comprising memory elements, a transmitter and a photovoltaic cell. As amended, claims 31 and 41 describe transponders wherein the memory elements and transmitter are powered only when the photovoltaic cell is illuminated by laser light.

Tuttle is cited a teaching a photovoltaic recharging method used to passively recharge the battery of a transponder without requiring handling. The Applicant's transponder does not include this type of recharging scheme. Applicant's transponder does not contain a battery since the memory elements and transmitter are powered only when the photovoltaic cell is illuminated by laser light. This allows the Applicant's transponder to be reduced in size compared with conventional transponders (see Specification, page 11, lines 33-

38) and also allows only those transponders within the narrow focus of a laser light beam to be active, significantly reducing the noise level (see Specification, page 12, lines 16 – 18). Hence, the Applicant submits that the teachings of Tuttle have no application to the Applicant's invention.

Furthermore, although Nova does teach the detection of nucleic acids by immobilization onto solid particles, a scanner device, flow system for solid phase particles, a laser, hardware to decode the signal, and the use of a photocell in the integrated device, Nova does not teach the Applicant's transponder of claims 31 and 41. Nova does not teach a transponder comprising memory elements containing data indicating the sequence of the attached oligonucleotide probe, a radio-frequency transmitter and a photovoltaic cell, wherein the memory elements and transmitter are powered only when the photovoltaic cell is illuminated by laser light.

The Nova does discuss the use of a photocell to supplement a radio-frequency supplied voltage power source (column 25, lines 45 – 54) or the replacement of the radio-frequency antenna to a photocell (column 26, lines 62 – 67). However, a configuration where the memory elements and radio-frequency transmitter are powered only when the photovoltaic cell is illuminated by laser light is not disclosed.

In addition, although Nagai teaches a method of detecting a target nucleic acid, Nagai does not teach a method of sequencing a nucleic acid of unknown sequence. Hence, Nagai does not teach step (f) of amended claims 31 and 41 of

the Applicant's invention, which requires the determination of at least a portion of the sequence of the target nucleic acid.

Hence, for the reasons stated above, the method resulting from the proposed combination of Nagai, Nova and Tuttle is not the present invention.

Claims 31 – 46 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Nagai *et al.* (JP 04148700 A2) in view of Nova '629 and further in view of Kobayashi et al. (Mol. Cell. Probes (June 1995) and further in view of Tuttle (U.S. Patent Number 5,300,875).

The deficiencies of the combination of Nagai, Nova and Tuttle are discussed above. These deficiencies are not made up for by the Kobayashi reference. Kobayashi describes the detection of known single-base changes in genomic DNA. Claims 31 and 41 of the Applicant's invention are directed to a method of sequencing an unknown nucleic acid sequence.

Dependent claims 33 – 40, and 42 – 46 were rejected based on combinations Nagai, Nova, Kobayashi, and Tuttle. Since these claims are dependent claims from claims 31 and 41 respectively, and include the limitations of their independent claims, the remarks in regards to the independent claims 31 and 41 overcome the rejection of these claims

Attached hereto is a marked up version of the changes made to the claims. In reply to the Office Action dated April 10th, 2002, favorable reconsideration and allowance of this application are respectively requested for

the reasons set forth in the above remarks. Attached hereto is a marked up version of the changes made to the claims. If, for any reason, the Examiner is unable to allow the application and feels that an interview would be helpful to resolve any remaining issues, he is respectfully requested to contact the undersigned attorney at (312) 321-4229.

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE.

Claims

31(Amended). A method of determining the sequence of a target nucleic acid in a sample, comprising the steps of:

(a) providing at least one solid phase particle having a transponder, the particle having an oligonucleotide probe attached directly or indirectly to an outer surface, and the transponder comprising of memory elements containing data indicating the sequence of the oligonucleotide probe, a radio-frequency transmitter and a photovoltaic cell, wherein the memory elements and transmitter are powered only when the photovoltaic cell is illuminated by laser light [providing a source of electrical power for the memory elements and transmitter when illuminated by light];

(b) contacting the solid phase particle with the sample to form a sample mixture;

(c) providing conditions allowing annealing of at least a portion of the sequence of the target nucleic acid to a complementary sequence on the oligonucleotide probe;

(d) illuminating the solid phase particle with [the] laser light to detect the presence of a fluorescent label indicative of binding of at least a portion of the sequence of the target nucleic acid to the oligonucleotide probe; [and]

(e) decoding the data on the memory elements to identify the sequence of the oligonucleotide probe[.] ; and

(f) analyzing the sequence of the oligonucleotide probe to which target nucleic acid is bound to determine at least a portion of the sequence of the target nucleic acid.

41(Amended). A method of determining the sequence of target nucleic acid thought to contain a plurality of subsequences, comprising the steps of:

(a) providing at least two populations of solid phase particles, each particle comprising an oligonucleotide probe corresponding to one of the subsequences, attached directly or indirectly to an outer surface of the particle, and a transponder comprising memory elements containing data indicating the sequence of the attached oligonucleotide probe, a radio-frequency transmitter and a photovoltaic cell, wherein the memory elements and transmitter are powered only when the photovoltaic cell is illuminated by laser light [providing a source of electrical power for the memory elements and transmitter when illuminated by light]; and wherein a first population of solid phase particles has a different oligonucleotide probe sequence than a second population of solid phase particles;

(b) combining the sample and the at least two populations of the solid phase particles;

(c) providing conditions allowing annealing of at least a portion of the sequence of the target nucleic acid to complementary sequences on the oligonucleotide probes;

(d) illuminating the solid phase particles with [the] laser light to detect the presence of a fluorescent label indicative of binding of at least a portion of the target nucleic acid to the oligonucleotide probes; [and]

(e) decoding the memory elements to identify the sequence of the oligonucleotide probes[.]; and

(f) analyzing the sequence of the oligonucleotide probes to which target nucleic acid is bound to determine at least a portion of the sequence of the target nucleic acid.